

N60138.AR.003150
FISC WILLIAMSBURG
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FINAL NO FURTHER ACTION TECHNICAL MEMORANDUM FOR TETRACHLOROETHENE
DETECTED IN GROUNDWATER UPGRADIENT OF SITE 4 CHEATHAM ANNEX FISC
WILLIAMSBURG VA
1/10/2014
CH2M HILL

No Further Action Technical Memorandum for PCE Detected in Groundwater Upgradient of Site 4 Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

PREPARED FOR: CAX Partnering Team:
Scott Park – NAVFAC Mid-Atlantic
Gerald Hoover – USEPA, Region III
Wade Smith - VDEQ

COPY TO: Marlene Ivester – CH2M HILL
Stephanie Sawyer – CH2M HILL

PREPARED BY: CH2M HILL

DATE: January 10, 2014

This Technical Memorandum (TM) summarizes site history, presents and evaluates recently collected groundwater data, and provides the rationale for no further action for tetrachloroethene (PCE) detected in groundwater upgradient of Site 4, located at Naval Weapons Station Yorktown Cheatham Annex (CAX).

During the Sites 4, 9, and Area of Concern 3 Site Inspection (SI), PCE was detected in groundwater at an estimated¹ concentration of 1 microgram per liter (µg/L) in the upgradient, offsite temporary monitoring well CAS04-GW04 (CH2M HILL, 2011). Based on the presence of PCE in groundwater at this location (CAS04-GW04), the CAX Partnering Team agreed to additional investigation to determine whether this detection of PCE was an isolated occurrence of PCE in groundwater or the leading edge of contamination from an unidentified, upgradient source area.

Background

CAX is located in Williamsburg, Virginia, on the York-James Peninsula (**Figure 1**). The peninsula trends northwest-southeast and is bordered to the southwest by the James River, to the northeast by the York River, and to the southeast by the confluence of the James River and the Chesapeake Bay. CAX was established in June 1943 as a satellite unit of the Navy Supply Depot in Norfolk, Virginia, to provide bulk storage facilities. Prior to 1943, CAX had been the location of the Penniman Shell Loading Plant, a large powder and shell loading facility operated by DuPont during World War I. Today, the mission of CAX is supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

An SI was conducted at Site 4 in 2009. Groundwater samples were collected from four temporary monitoring wells (CAS04-GW01 through CAS04-GW04) and analyzed for Target Compound List organics².

One finding from the SI groundwater analytical results was that the volatile organic compound, PCE, was detected upgradient of Site 4 in groundwater at temporary monitoring well sample location CAS04-GW04 at an estimated concentration of 1 µg/L (**Attachment A**). Since PCE was not detected in any other groundwater samples within Site 4 during the SI or the subsequent Site 4 Remedial Investigation (RI), the origin and potential distribution of this contaminant was unknown. As such, the United States Environmental Protection Agency (USEPA), in comments provided on the Site 4 SI Report (CH2M HILL, 2011), stated additional investigation was needed to determine if the PCE detection was isolated or the leading edge of a plume. The Navy agreed to further

¹ The detected concentration was estimated because PCE was detected by the laboratory at a concentration below the reporting limit but above the method detection limit. The result was therefore qualified with a J (i.e., 1 J µg/L) to signify that the indicated concentration was an estimate.

² Volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, Selected Ion Monitoring polycyclic aromatic hydrocarbons, and Target Analyte List total and dissolved metals, including cyanide.

investigate this PCE detection. However, the location of the detection (approximately 50 feet upgradient of Site 4) and the nature of buried debris present at Site 4 (e.g., railroad ties, metal, construction material) indicates that the PCE detection is not likely related to historical activities conducted at Site 4.

Investigation Methodology

This section summarizes the field investigation procedures of the groundwater sampling effort conducted upgradient of Site 4 in September 2013. The field activities were conducted in accordance with the approved *Final Tier II Sampling and Analysis Plan Addendum, Site 4 – Remedial Investigation, DPT Groundwater Collection* (CH2M HILL, 2013).

Pre-Investigation Activities

Prior to the groundwater sampling activities, an underground utility clearance was conducted upgradient of Site 4 on August 23, 2013, by ECLS of Angier, North Carolina.

DPT Groundwater Sampling

On September 3 and 4, 2013, one direct-push technology (DPT) groundwater sample point (CAS04-DW01) was installed in the immediate vicinity of the SI temporary monitoring well sample location CAS04-GW04, and four DPT groundwater sample points (CAS04-DW02 through CAS04-DW05) were installed 10 feet from CAS04-DW01 (upgradient, downgradient, and crossgradient) (**Figure 2**).

The DPT groundwater samples were collected in order to confirm the absence or presence of PCE in groundwater upgradient of Site 4 and to determine if any detected PCE represented the leading edge of a potential PCE plume migrating from an upgradient source area. As noted in the SAP Addendum, all groundwater sampling activities were conducted in accordance with the Standard Operating Procedure (SOP) entitled *Direct Push Groundwater Sample Collection* (CH2M HILL, 2013).

The DPT sampling points were installed in the Yorktown-Eastover aquifer, where groundwater was first encountered and where PCE was originally detected. Groundwater samples were collected using a peristaltic pump and low-flow purging and sampling methodology, as described in the SOP entitled *Low-Flow Groundwater Sampling from Monitoring Wells – EPA Region I and III* (CH2M HILL, 2013). During the groundwater purging, field geochemical parameters³ were collected using a water quality meter in accordance with the SOP entitled *Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, ORP, and Temperature Using a Horiba or YSI Water Quality Parameter Meter with Flow-through Cell* (CH2M HILL, 2013). Groundwater purging continued until geochemical parameters stabilized to within 10 percent between subsequent readings collected at least 5 minutes apart. A summary of the field parameter measurements recorded prior to each DPT groundwater sample collection is provided in **Attachment B**.

Following groundwater sample collection, the samples were packed on ice in accordance with the SOP entitled *Sample Preservation* (CH2M HILL, 2013) and shipped via overnight courier to Katahdin Analytical Services, Inc. in Scarborough, Maine. All DPT groundwater samples were analyzed solely for PCE, per CAX Partnering Team agreement and as presented in the SAP Addendum.

Decontamination Procedures

All decontamination activities were conducted in accordance with the SOP entitled *Decontamination of Personnel and Equipment*, as applicable (CH2M HILL, 2013). Personal protective equipment (PPE), such as nitrile gloves, was treated as non-hazardous solid waste. After use, PPE was placed in plastic bags and disposed in an onsite trash dumpster. All DPT and non-disposable sampling equipment were decontaminated prior to each use.

Rinse water generated during decontamination of sampling equipment was collected and transferred to a 55-gallon drum to be disposed with investigation-derived waste generated as part of other environmental investigations being conducted at CAX.

³ Dissolved oxygen, oxidation-reduction potential, temperature, conductivity, pH, turbidity, and salinity.

Surveying Activities

Following the completion of sampling activities, global positioning system (GPS) coordinates were collected with a hand-held GPS unit to record sample locations.

Sample Analysis and Quality Assurance/Quality Control

The DPT groundwater samples were collected and analyzed for PCE. In addition, quality control samples (e.g., equipment rinsate blanks, matrix spike, matrix spike duplicate) were collected. The analytical results are provided in **Table 1**.

Data Validation and Evaluation

Analytical results were validated by CH2M HILL data validators. Typical areas of review include holding time compliance, calibration verification, quality assurance/quality control blank results, matrix spike precision and accuracy, accuracy as demonstrated by laboratory control samples, surrogate recoveries, internal standard performance, and interference checks. Any non-conformance was documented and qualifiers were applied to the data, if necessary. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes. The validation of data was completed as detailed in Table A-39, *Data Verification and Validation (Steps I and IIa/IIb) Process Table* in Appendix A of the RI Sampling and Analysis Plan (SAP) Addendum (CH2M HILL, 2013).

Conceptual Site Model

The Conceptual Site Model (CSM) for groundwater upgradient of Site 4 is based on the historical data and information summarized above, and interprets the physical setting and distribution of contamination, as described below.

Physical Setting

The DPT sample locations CAS04-DW01 through CAS04-DW05, and the surrounding area, are within an area heavily vegetated with trees (**Figure 2**). Site 4 is located approximately 50 feet to the east, and a parking lot is located to the west-southwest approximately 100 feet. Based on groundwater elevation measurements collected during the Site 4 RI field activities, the DPT sample locations are located upgradient of Site 4, with groundwater flowing north-northeast towards Upstream Pond.

Ground elevations at CAX vary from sea level along the eastern boundary, which borders the York River, to a maximum elevation of approximately 50 feet above mean sea level on a few scattered hills in the western portion of the base. At the DPT sample locations CAS04-DW01 through CAS04-DW05, the approximate ground elevation is 21 feet above mean sea level.

The Yorktown-Eastover aquifer is the uppermost aquifer unit beneath Site 4 and extends beneath all of CAX with a thickness ranging from 60 to 100 feet. Transmissivities in the aquifer range from 0.5 to 40 square feet per day (ft^2/day). At CAX, groundwater flow within the Yorktown-Eastover aquifer is locally controlled by topography, with discharge to nearby surface water bodies and a primary flow and discharge direction towards the York River. At DPT groundwater sample locations CAS04-DW01 through CAS04-DW05, groundwater was encountered at 9.5 feet below ground surface.

There is no specified designated use for the DPT sample locations CAS04-DW01 through CAS04-DW05 and the surrounding area. While this area is located within the restricted Cheatham Annex Depot (CAD) warehouse area, access is not restricted to CAX visitors (e.g., civilian employees, military personnel) since the gate along D Street near CAD Building 11 is no longer locked on a regular basis. Future land use at this area is not expected to change in the foreseeable future.

Distribution of Contamination

Five DPT groundwater samples (CAS04-DW01 through CAS04-DW05) were collected and analyzed for PCE in accordance with the approved UFP-SAP Addendum (CH2M HILL, 2013). PCE was not detected in any of the DPT groundwater samples (**Figure 2**). **Table 1** presents the analytical results.

Distribution of Contamination

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Conclusions

Based on the detected presence of an estimated concentration of PCE in groundwater at location CAS04-GW04 during the Site 4 SI field activities in 2009, the CAX Partnering Team agreed to additional investigation to determine whether this detection was an isolated occurrence of PCE in groundwater or potentially the leading edge of contamination migrating from an unidentified, upgradient source area.

Five DPT groundwater samples (CAS04-DW01 through CAS04-DW05) were collected at and immediately surrounding SI sample location CAS04-GW04 and analyzed for PCE during this supplemental groundwater investigation. The results showed that PCE was not detected in any of the five DPT groundwater samples collected upgradient of Site 4, and that the earlier detection of an estimated concentration of PCE was likely isolated and/or anomalous.

As presented in the Decision Tree (Figure 4A of the SAP Addendum [CH2M HILL, 2013]), a TM would be prepared to document No Further Action for PCE in groundwater. This TM satisfies that requirement.

No Further Action Consensus

The Navy, in partnership with the USEPA and Virginia Department of Environmental Quality (VDEQ), has determined that PCE is not present in the groundwater at or in the vicinity of SI sample location CAS04-GW04, upgradient of Site 4, and that no further action is required.

Mr. Scott Park
NAVFAC Mid-Atlantic

 Date 1-14-14

Mr. Gerald Hoover
USEPA, Region III

 Date 1-14-14

Mr. Wade Smith
VDEQ

 Date 01/14/2014

References

CH2M HILL. 2011. *Final Site Inspection Report, Site 4, Site 9 and Area of Concern 3, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex, Williamsburg, Virginia*. December.

CH2M HILL. 2013. *Final Tier II Sampling and Analysis Plan Addendum, Site 4 – Remedial Investigation, DPT Groundwater Collection, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex, Williamsburg, Virginia*. August.

Table

TABLE 1

Groundwater Analytical Results**Groundwater Upgradient of CAX Site 4; No Action Technical Memorandum****Cheatham Annex****Williamsburg, Virginia**

Sample ID	Adjusted Tapwater RSL, May 2013	MCL	CAS04-DW01-0913	CAS04-DW02-0913	CAS04-DW03-0913	CAS04-DW04-0913	CAS04-DW05-0913
Sample Date			9/3/13	9/3/13	9/3/13	9/4/13	9/4/13
Chemical Name							
Volatile Organic Compounds (UG/L)							
Tetrachloroethene	3.5	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

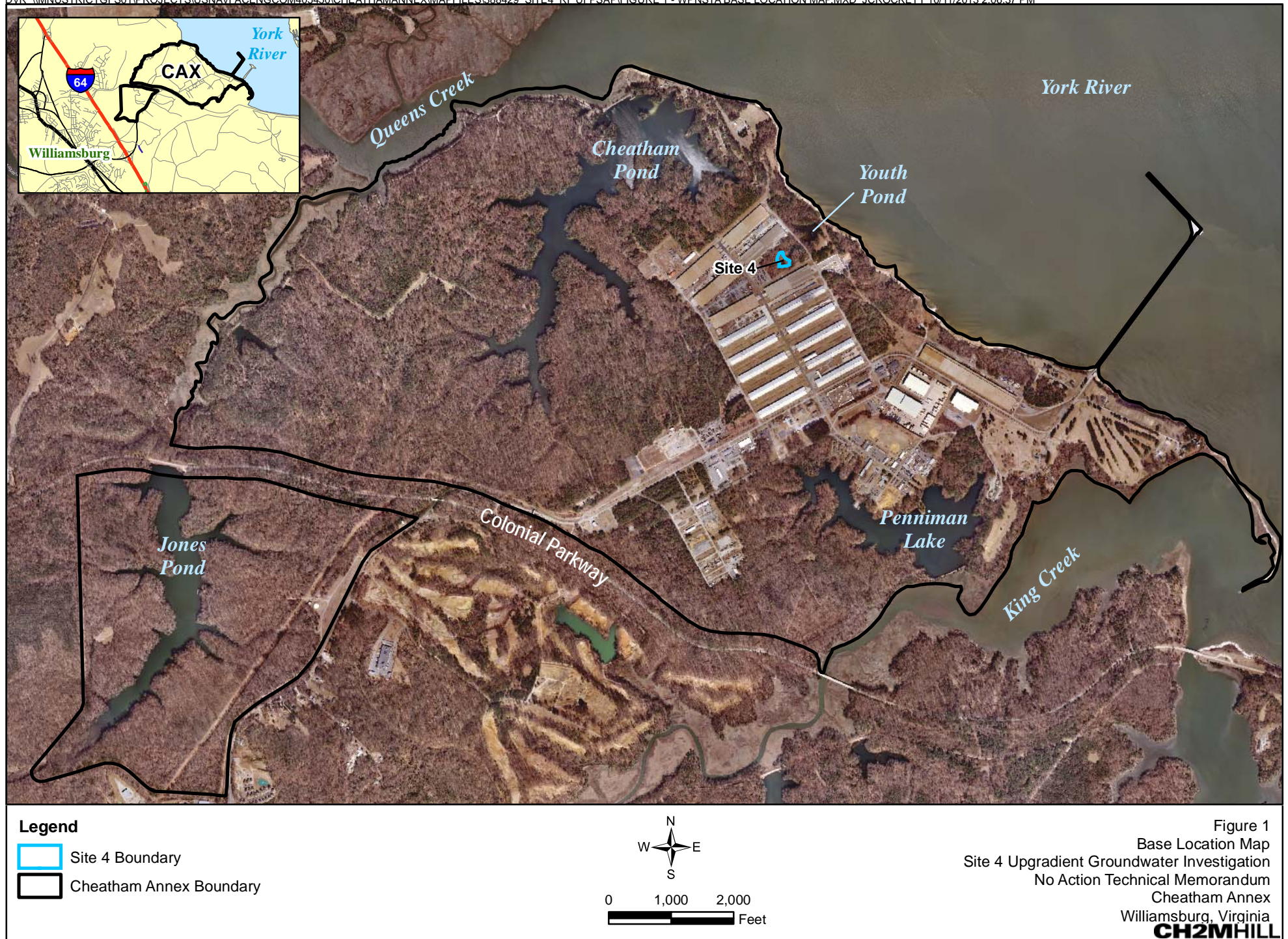
U - The material was analyzed for, but not detected

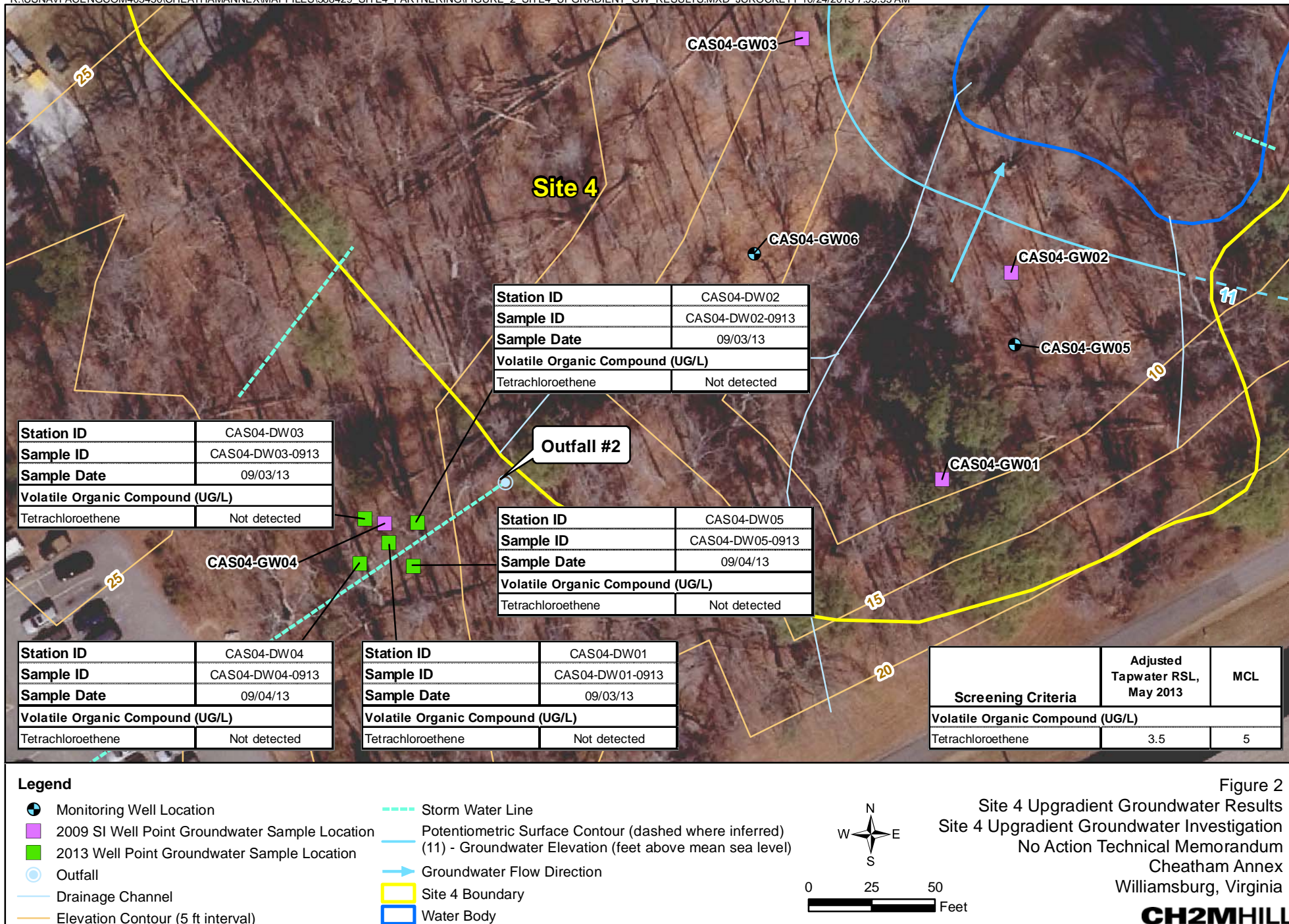
UG/L - Micrograms per liter

MCL - Maximum Contaminant Level

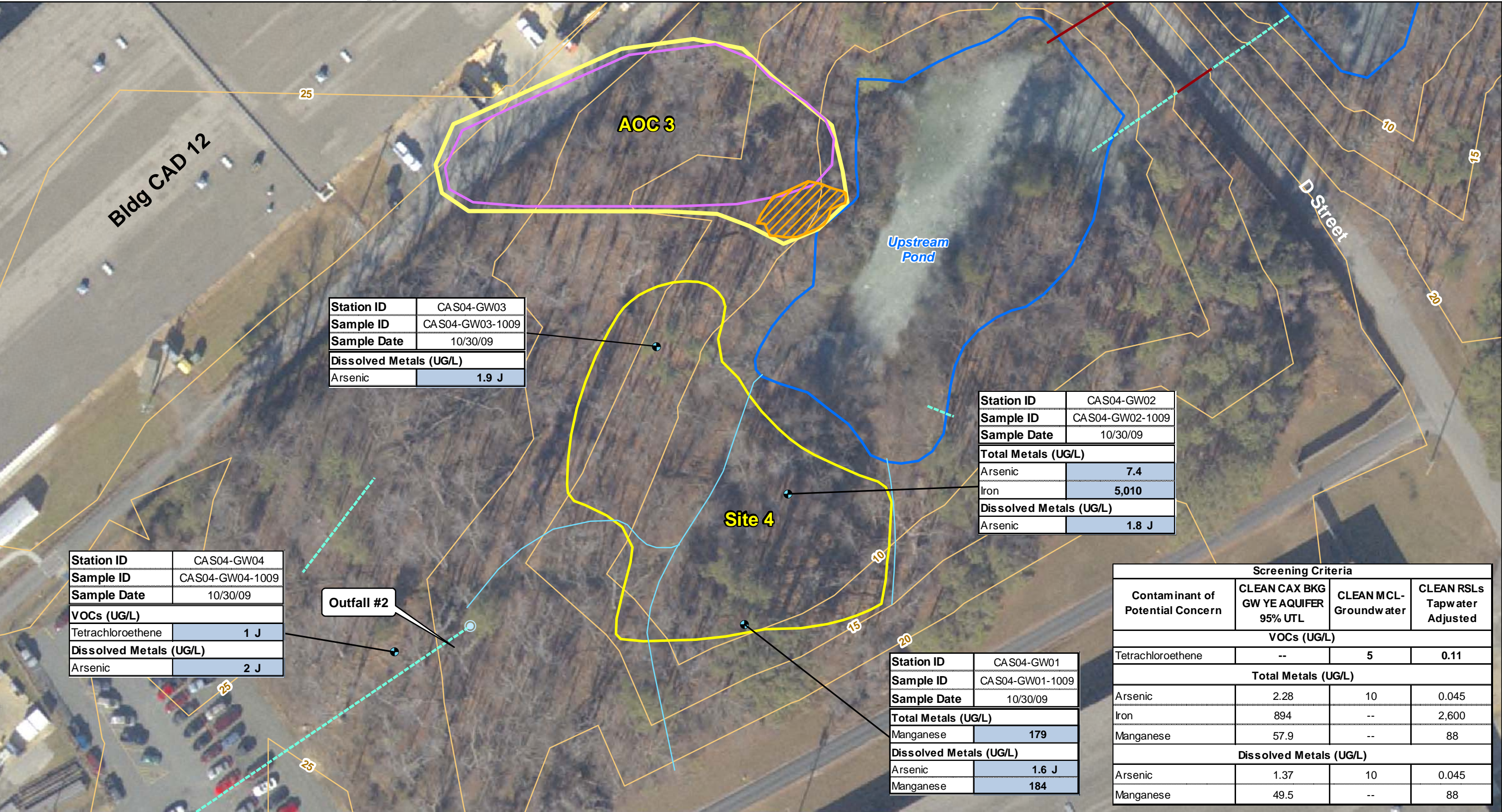
RSL - Regional Screening Level

Figures





Attachment A
Groundwater Exceedance Figure from
Site 4 Site Inspection Report



Legend

- 2009 SI Well Point Groundwater Sample Location
- Study Area Boundary
- Outfall
- Drainage Channel
- Storm Water Line
- Culvert
- Elevation Contour (5 ft interval)
- Water Body
- Surface Debris Pile
- Disturbed Area (1955 Aerial Photograph)
- Exceeds BKG & MCL
- Exceeds BKG & RSL
- Exceeds BKG, MCL & RSL

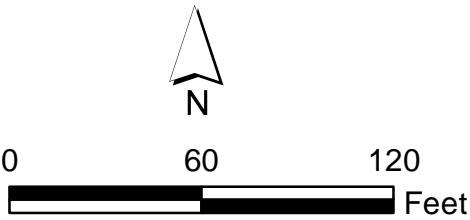



Figure 3-9
Site 4 Groundwater Exceedance Results
Sites 4, 9, and AOC 3 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Attachment B
2013 Groundwater Field Parameters

		PROJECT NUMBER						
		388429.FI.FS.78						
		DPT GROUNDWATER PARAMETERS						
PROJECT : CAX Upgradient of Site 4, DPT Groundwater Sample Collection								
			Conductivity	Temperatur e	Dissolved Oxygen	Redox Potential	Turbidity	Well Screen
DPT GW Sample Location	Date and Time	pH	(mS/cm)	(^o C)	(mg/L)	(mV)	(NTU)	(ft bgs)
CAS04-DW01	9/3/13, 1624	6.79	0.616	20.63	0.77	-66.9	>1000	10-14
CAS04-DW02	9/3/13, 1728	6.68	0.637	19.72	0.70	-26.7	18.1	10-14
CAS04-DW03	9/3/13, 1824	6.73	0.677	18.88	0.53	-34.2	45.6	10-14
CAS04-DW04	9/4/13, 1010	6.55	0.794	19.24	0.88	-24.1	174.0	10-14
CAS04-DW05	9/4/13, 1110	6.90	0.660	20.13	0.61	-36.3	92.8	10-14

Notes:

mS/cm – milliSiemens per centimeter

°C – degrees Celsius

mg/L – milligrams per liter

mV – millivolts

NTU - nephelometric turbidity units

ft - feet

Response to Comments

No Further Action Technical Memorandum for PCE Detected in Groundwater Upgradient of Site 4 Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

PREPARED FOR: CAX Partnering Team:
Scott Park – NAVFAC Mid-Atlantic
Gerald Hoover – USEPA, Region III
Wade Smith - VDEQ

COPY TO: Marlene Ivester – CH2M HILL
Stephanie Sawyer – CH2M HILL

PREPARED BY: CH2M HILL

DATE: November 22, 2013

This Technical Memorandum (TM) summarizes site history, presents and evaluates recently collected groundwater data, and provides the rationale for no further action for tetrachloroethene (PCE) detected in groundwater upgradient of Site 4, located at Naval Weapons Station Yorktown Cheatham Annex (CAX).

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Background

CAX is located in Williamsburg, Virginia, on the York-James Peninsula (**Figure 1**). The peninsula trends northwest-southeast and is bordered to the southwest by the James River, to the northeast by the York River, and to the southeast by the confluence of the James River and the Chesapeake Bay. CAX was established in June 1943 as a satellite unit of the Navy Supply Depot in Norfolk, Virginia, to provide bulk storage facilities. Prior to 1943, CAX had been the location of the Penniman Shell Loading Plant, a large powder and shell loading facility operated by DuPont during World War I. Today, the mission of CAX is supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

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determine if the PCE detection was isolated or the leading edge of a plume. The Navy agreed to further investigate this PCE detection. However, the location of the detection (approximately 50 feet upgradient of Site 4) and the nature of buried debris present at Site 4 (e.g., railroad ties, metal, construction material) indicates that the PCE detection is not likely related to historical activities conducted at Site 4.

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³ Dissolved oxygen, oxidation-reduction potential, temperature, conductivity, pH, turbidity, and salinity.

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Conceptual Site Model

The **Conceptual Site Model (CSM)** for groundwater upgradient of Site 4 is based on the historical data and information summarized above, and interprets the physical setting and distribution of contamination.

Comment [WS1]: CSM not included

Physical Setting

The DPT sample locations CAS04-DW01 through CAS04-DW05, and the surrounding area, are within an area heavily vegetated with trees (**Figure 2**). Site 4 is located approximately 50 feet to the east, and a parking lot is located to the west-southwest approximately 100 feet. Based on groundwater elevation measurements collected during the Site 4 RI field activities, the DPT sample locations are located upgradient of Site 4, with groundwater flowing north-northeast towards Upstream Pond.

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Conclusions

Based on the detected presence of an estimated concentration of PCE in groundwater at location CAS04-GW04 during the Site 4 SI field activities in 2009, the CAX Partnering Team agreed to ~~further~~ additional investigation to determine whether this detection was an isolated occurrence of PCE in groundwater or potentially the leading edge of contamination migrating from an unidentified, upgradient source area.

Five DPT groundwater samples (CAS04-DW01 through CAS04-DW05) were collected at and immediately surrounding SI sample location CAS04-GW04 and analyzed for PCE during this supplemental groundwater investigation. The results showed that PCE was not detected in any of the five DPT groundwater samples collected upgradient of Site 4, and that the earlier detection of an estimated concentration of PCE was likely isolated and/or anomalous.

As presented in the Decision Tree (Figure 4A of the SAP Addendum [CH2M HILL, 2013]), a TM would be prepared to document No Further Action for PCE in groundwater. This TM satisfies that requirement.

No Further Action Consensus

The Navy, in partnership with the USEPA and Virginia Department of Environmental Quality (VDEQ), has determined that PCE is not present in the groundwater at or in the vicinity of SI sample location CAS04-GW04, upgradient of Site 4, and that no further action is required.

Mr. Scott Park
NAVFAC Mid-Atlantic _____ Date _____

Mr. Gerald Hoover
USEPA, Region III _____ Date _____

Mr. Wade Smith
VDEQ _____ Date _____

References

CH2M HILL. 2011. *Final Site Inspection Report, Site 4, Site 9 and Area of Concern 3, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex, Williamsburg, Virginia*. December.

CH2M HILL. 2013. *Final Tier II Sampling and Analysis Plan Addendum, Site 4 – Remedial Investigation, DPT Groundwater Collection, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex, Williamsburg, Virginia*. August.

Response to Comments

No Further Action Technical Memorandum for PCE Detected in Groundwater Upgradient of Site 4

**Naval Weapons Station Yorktown Cheatham Annex,
Williamsburg, Virginia
January 10, 2014**

Comments received by email on January 7, 2014 from Wade Smith, Virginia Department of Environmental Quality. In addition to the comment below, all suggested editorial changes were made.

VADEQ Comment (regarding the Conceptual Site Model section, first paragraph, first sentence): CSM not included.

Response: A figure showing the graphical representation of the CSM is not included in the Tech Memo; however, the text in the referenced section of the Tech memo describes the conceptual site model for the site. The Tech Memo has been revised as follows:

The Conceptual Site Model (CSM) for groundwater upgradient of Site 4 is based on the historical data and information summarized above, and interprets the physical setting and distribution of contamination, as described below.

Regulatory Acceptance



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

**REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029**

January 8, 2014

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft No Further Action Technical Memorandum for PCE Detected in Groundwater
Upgradient of Site 4, Naval Weapons Station Yorktown Cheatham Annex,
Williamsburg, Virginia

Mr. Park:

EPA has reviewed the subject document dated November 22, 2013. EPA has no comments on this document. Please submit a final copy of the subject document for our records.

If you have any questions, please contact me at 215-814-2077.

Sincerely,

A handwritten signature in blue ink, reading "Gerald F. Hoover", is positioned above the typed name.

Gerald F. Hoover, RPM
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

Sawyer, Stephanie/VBO

From: Smith, Wade (DEQ) [Wade.Smith@deq.virginia.gov]
Sent: Monday, January 13, 2014 6:56 AM
To: scott.park@navy.mil
Cc: Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; Hoover.Gerald@epa.gov
Subject: CAX: Draft NFA Tech Memo for PCE Detected in Groundwater Upgradient of Site 4 - DEQ Comments

Follow Up Flag: Follow up
Flag Status: Flagged

The proposed revision is acceptable to the DEQ.

Thanks,
wade

From: Stephanie.Sawyer@CH2M.com [<mailto:Stephanie.Sawyer@CH2M.com>]
Sent: Friday, January 10, 2014 1:52 PM
To: Smith, Wade (DEQ); scott.park@navy.mil
Cc: Marlene.Ivester@CH2M.com; Hoover.Gerald@epa.gov; Stephanie.Sawyer@CH2M.com
Subject: RE: Draft NFA Tech Memo for PCE Detected in Groundwater Upgradient of Site 4 - DEQ Comments

Wade,

Attached is the Navy's response to your one comment on the draft NFA Tech Memo for PCE Detected in Groundwater Upgradient of Site 4. Upon your approval of this response, we will circulate the document signature page (since the EPA had no comments) for team signature and submit the final version of this document for everyone records.

Thanks,
Stephanie

From: Smith, Wade (DEQ) [<mailto:Wade.Smith@deq.virginia.gov>]
Sent: Tuesday, January 07, 2014 2:27 PM
To: scott.park@navy.mil
Cc: Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; Hoover.Gerald@epa.gov
Subject: CAX: Draft NFA Tech Memo for PCE Detected in Groundwater Upgradient of Site 4 - DEQ Comments

I have attached DEQ's comments (track changes via Word) on the above-referenced memo received on November 22, 2013.

Upon receipt of the requested revisions, the DEQ will issue an official letter for your files.

Please let me know if you have any questions.

Sincerely,
wade

From: Stephanie.Sawyer@CH2M.com [<mailto:Stephanie.Sawyer@CH2M.com>]
Sent: Friday, November 22, 2013 1:21 PM
To: Hoover.Gerald@epa.gov; Smith, Wade (DEQ); scott.park@navy.mil
Cc: Marlene.Ivester@CH2M.com
Subject: Draft No Further Action Technical Memorandum for PCE Detected in Groundwater Upgradient of Site 4

To All:

Attached is the Draft No Further Action Technical Memorandum for PCE Detected in Groundwater Upgradient of Site 4 for your review. Attached to this email is the document submittal cover letter, a pdf of the whole document, and the Word file for the text should you wish to comment electronically (please track-changes/red-line).

Comments are respectfully requested by January 23, 2014 (i.e., 60-days).

Thanks,
Stephanie



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